Vigilohm IM10-H, Vigilohm IM20-H

Insulation Monitoring Device for Hospitals

User Manual

09/2011

VIGED310023EN

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When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

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Failure to observe this information can result in injury or equipment damage.

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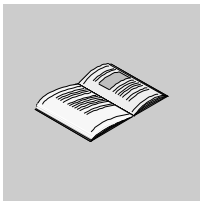

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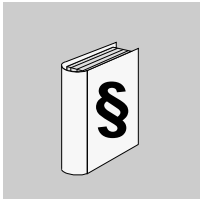
Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

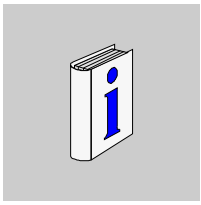
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual is intended for use by designers, system builders, and maintenance technicians who are concerned with ungrounded electrical distribution systems (IT) featuring insulation monitoring devices (IMDs) for medical applications.

Validity Note

To ensure maximum patient safety, operating rooms call for continuous availability and impeccable quality in terms of electrical power. Consequently, the relevant standards lay down highly stringent rules.

At certain medical facilities, use of the IT system is mandatory.

The Vigilohm IM10-H and IM20-H insulation monitoring devices are the key components within this subsystem.

Related Documents

Title of Documentation	Reference Number
Instruction Sheet: Vigilohm IM10-H Insulation Monitoring Device	S1A40440
Instruction Sheet: Vigilohm IM20-H Insulation Monitoring Device	S1A40442
Secure power distribution and monitoring solution for operating theatres - Solution guide	DESWED109024EN
Solution de distribution électrique sécurisée et de surveillance pour blocs opératoires - Guide de la solution	DESWED109024FR

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User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Presentation

1

What's in this Chapter?

This chapter contains the following topics:

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Presentation

Use the IT System to Improve the Availability of Power Systems

Continuity of service is an essential operational requirement for power systems, as is ensuring the protection of people and property. There are many applications which vary from country to country.

The "ungrounded" IT system is the best option for ensuring continuity of service. Even after an initial insulation fault has occurred, the installation can continue to function without posing any danger to people or equipment. However, the faulty circuit must be detected and repaired before a second fault occurs. The fact that the IT system can tolerate an initial fault means that maintenance operations can be improved and carried out safely and without any pressure.

The IT System at Medical Facilities

At Group 2 medical facilities, the medical IT system must be used for the supply circuits. These include those for the electrical medical equipment as well as for the life support systems and systems intended for surgical applications, on the one hand, and the other equipment in the patient environment, on the other.

It is practically impossible to draw up a list of Group 2 facilities because the method for categorizing how facilities are used can vary from one country to another and may even differ within the same country. The list of examples below has been provided purely for information:

- Anaesthetizing room
- Operating room
- Pre-operating room
- Surgical dressings (plaster) room
- Post-op recovery room
- Cardiac catheterization room
- Intensive care room
- Angiographic examination room
- Premature babies room

Monitor Insulation Resistance (R)

Standards IEC 364, IEC 61557-8, and IEC 60364-7-710 stipulate that the installation must be ungrounded when the IT system is used.

In the event of only one ground or earth fault, the fault current is very low and interruption is unnecessary. However, given that a second fault could potentially cause the circuit breaker to trip, an insulation monitoring device has to be installed to indicate an initial fault. This device must trigger an audible and/or a visual signal.

By constantly monitoring the insulation resistance, you can keep track of the system quality, which is a form of preventive maintenance.

Function of Vigilohm IM10-H and IM20-H Devices

The Vigilohm IM10-H and IM20-H are digital insulation monitoring devices (IMDs) for low-voltage systems with isolated neutral IT. Assigned to specific IT islands in hospitals, they can be used to monitor the insulation of a system and signal any insulation faults as soon as they occur.

The Vigilohm IM10-H and IM20-H apply a low-frequency AC voltage between the system and ground. The insulation is then assessed on the basis of the current value returned.

The Vigilohm IM10-H and IM20-H offer the following functions:

- Insulation resistance display (R)
- Detection of insulation faults in accordance with a configurable threshold
- Detection of a lost connection (ground or injection)

The Vigilohm IM20-H offers the following additional functions:

- Communication via the Modbus RS-485 protocol
- Insulation fault log
- Transformer monitoring:
  - Display of load current for secondary (as a percentage)
  - Threshold-based triggering of an alarm (as a percentage of nominal current)
  - Temperature alarm (bimetal contact)

Selection Guide

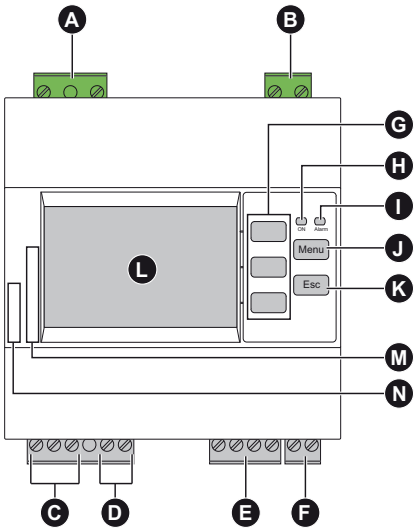
Function	Vigilohm IM10-H	Vigilohm IM20-H
Measurement and display of IT system insulation resistance	√	√
Threshold-based triggering of alarm	√	√
Display of transformer load current	–	√
Transformer overload alarm	–	√
Transformer high temperature alarm	–	√
Time-tagged log (insulation faults, overloads, and transformer overheating events)	–	√
Communication via Modbus RS-485	–	√
Remote compatibility in operating room (Vigilohm HRP)	√	√

Physical Description

Physical Description

Physical Description

The Vigilohm IM10-H and IM20-H feature 3 and 6 terminal blocks respectively (identifiers A to F). The various features of the Vigilohm are shown in the diagram below:



A Injection terminal block
B Vigilohm auxiliary power supply terminal block
C Alarm relay terminal block
D Terminal block for 1 A or 5 A CT input for measuring the secondary current of the insulation transformer (Vigilohm IM20-H)
E Modbus communication terminal block (Vigilohm IM20-H)
F Terminal block for the bimetal input for monitoring the temperature of the insulation transformer (Vigilohm IM20-H)
G Contextual menu buttons
H Operating LED
I Alarm LED
J **Menu** button for accessing main menu
K Button for returning to previous menu or canceling a parameter entry
L Display
M Vigilohm serial number
N Vigilohm product catalog number (IMD-IM10-H or IMD-IM20-H)

Vigilohm HRP Accessory

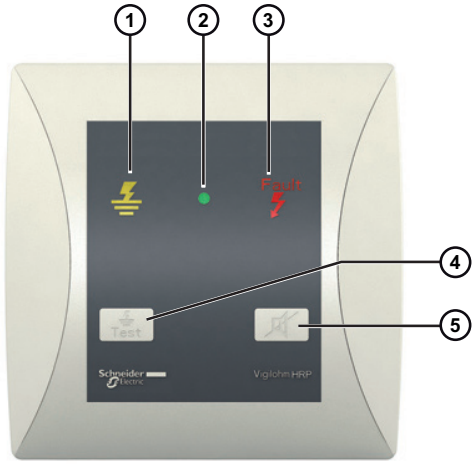
Presentation

The Vigilohm HRP (Hospital Remote Panel) (catalog number 50168) remote accessory for operating rooms serves as a user interface for the systems that are used to monitor electrical installations in hospitals.

Installed in the operating block, the Vigilohm HRP lets hospital staff know, in real time, whether the installation is operating correctly or whether there is a fault:

- Insulation fault affecting the electrical equipment of the operating block
- Electrical fault following tripping of a protective circuit breaker or overloading of a current transformer

Physical Description



Number	Description
1	Orange LED: Visual signal indicating an insulation fault
2	Green LED: Indicates that the installation is operating correctly
3	Red LED: Visual signal indicating an electrical fault (transformer overloaded or overheating or circuit breaker fault trip)
4	Pushbutton for testing the insulation monitoring system (daily test in accordance with standard IEC 60364-7-710)
5	Pushbutton for stopping the audible alarm in the event of an insulation fault or electrical fault. The sound level is set during installation (setting accessible on rear panel).

Mounting

The Vigilohm HRP is flush-mounted on a partition.

Connection

The Vigilohm HRP is connected to the alarm relay terminal block *(see page 21)*.

Characteristics

Characteristics		Value
Mechanical Characteristics		
Weight		0.5 kg
Case	Plastic	Vertical mounting
Degree of protection		IP54
		IK08
Dimensions	Height	170 mm
	Width	170 mm
	Depth	20 mm
Audible alarm	Factory setting	80 db (adjustable)
Electrical Characteristics		
Auxiliary supply voltage	24 Vdc	65 mA
Environment		
Operating temperature		0...40 °C
Storage temperature		-25...+70 °C
Maximum relative humidity		90%
Altitude		2000 m
Standards		
Compliant with	IEC 60364-7-710	Medical facilities
	IEC 61557-8	Electrical safety
	IEC 60601-1	Electrical medical equipment

NOTE: The Vigilohm HRP is subject to testing on Anios products (disinfectants, antiseptics, or detergents).

Installation

2

What's in this Chapter?

This chapter contains the following topics:

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Safety Measures

Specific Hazard Associated with Insulation Monitoring Devices (IMDs)

In the case of almost all electric and electronic devices, the device's power supply is the root cause of electrical hazards. The hazard can be eliminated by disconnecting the power supply.

This is not the case with insulation monitoring devices, which are connected to the system via the injection wire.

Consequently, this connection must be broken before carrying out any kind of work on the product.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before carrying out work of any kind, disconnect the Vigilohm from the monitored system by disconnecting the injection wire at terminal 1. Disconnect all the power supplies running to the Vigilohm and the equipment on which it is installed.
- Always use a correctly calibrated voltage tester to check that the injection wire and power supply have been properly disconnected.

Failure to follow these instructions will result in death or serious injury.

Other Safety Measures

Carefully read through the safety measures described below. You are always required to implement them fully before attempting to install, repair, or service electrical equipment.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

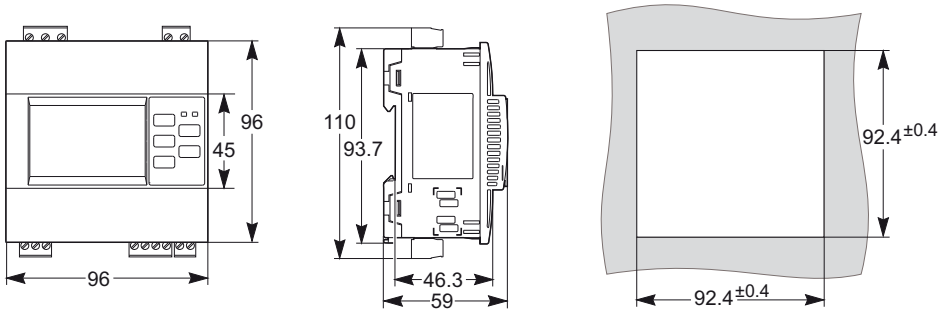
- Wear suitable personal protective equipment and follow the currently applicable electrical safety instructions.
- This equipment may only be installed by qualified electricians who have read all the relevant information.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested and tagged. Pay particular attention to the design of the power system. Consider all power supply sources, particularly the potential for backfeed.
- Before closing protective covers and doors, carefully inspect the work area to ensure that no tools or objects have been left inside the equipment.
- Take care when removing or replacing panels. Take special care to ensure that they do not come into contact with live busbars. To minimize the risk of injuries, do not tamper with the panels.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Failure to follow basic installation procedures can lead to personal injury as well as damage to electrical equipment or other property.
- NEVER shunt an external fuse/circuit breaker.
- The Vigilohm must be installed in a suitable electrical cabinet.

Failure to follow these instructions will result in death or serious injury.

Dimensions

Vigilohm Dimensions

mm



⚠ CAUTION

CUTTING HAZARD

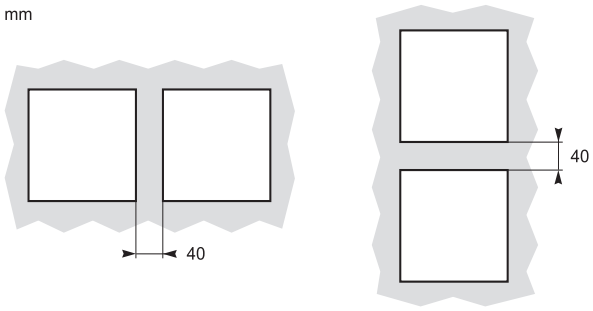
Trim the edges of the cut-out plates to remove any jagged edges.

Failure to follow these instructions can result in injury or equipment damage.

Constraints for Flush-mounting

Observe the correct distances between devices.

mm



Flush-mounting and Dismantling

Presentation

The Vigilohm can be attached to any flat, rigid vertical support using the 3 spring clips supplied. The device must not be tilted following installation.

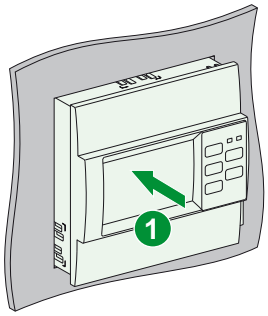
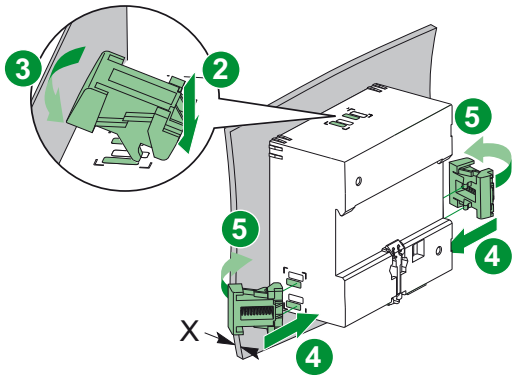
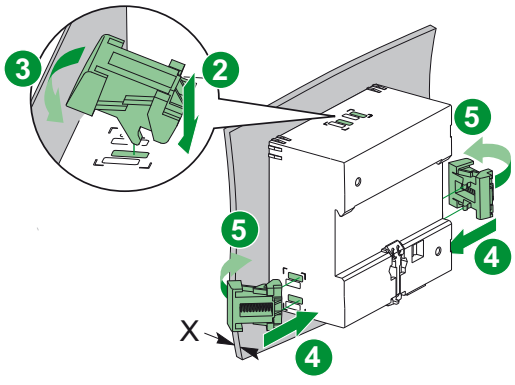
To free up useful space for control gear, you can attach the Vigilohm to the front panel of the floor-standing or wall-mounted enclosure.

Installation on a Support

Before attaching the Vigilohm, check the following:

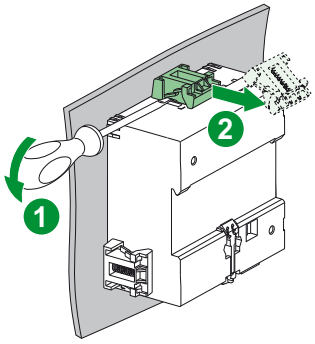
- The mounting plate must have a thickness of between 0.8 and 3.2 mm.
- A square measuring 92 x 92 mm must be cut out from the plate so the device can be installed.
- No terminal blocks may be connected to the unit.

To install the Vigilohm, proceed as follows:

<table>
<tr><th>Step</th><th colspan="2">Action</th></tr>
<tr><td>1</td><td colspan="2">Insert the Vigilohm in the cut-out in the mounting plate by tilting the device forward slightly.
 
</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">Depending on the thickness of the mounting plate, clip the 3 spring clips into the fixing slots on the device as follows:</td></tr>
<tr><td>Mounting Plate Thickness</td><td>Fixing Slots to Be Used</td></tr>
<tr><td>0.8 mm ≤ X ≤ 2 mm</td><td> 
</td></tr>
<tr><td>2 mm < X ≤ 3.2 mm</td><td> 
</td></tr>
<tr><td>3</td><td colspan="2">Wire up and insert the terminal blocks as shown in the relevant wiring diagram (see page 21) and as appropriate for the type of device concerned (Vigilohm IM10-H or IM20-H) (see page 12).</td></tr>
</table>

Removal from a Mounting Plate

To remove the Vigilohm from a mounting plate, proceed as follows:

Step	Action
1	Disconnect the terminal blocks from the Vigilohm.
2	Deal with each of the 3 spring clips as follows: Insert the blade of a screwdriver between the spring clip and the device. Then use the screwdriver as a lever to release the spring clip. 
3	Reinsert the terminal blocks, making sure that the correct positions on the device (Vigilohm IM10-H or IM20-H) *(see page 12)* are observed.

DIN Rail Mounting and Dismantling

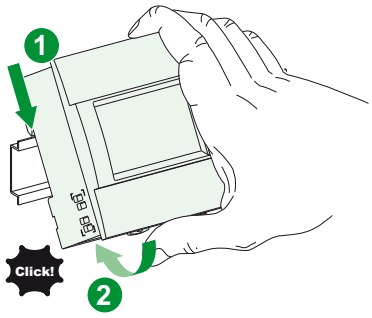
Presentation

You can install the Vigilohm on a DIN rail. The device must not be tilted following installation.

When mounting the device on, or dismantling it from, a DIN rail, you can keep the terminal blocks connected and/or wired up, or you can remove them and keep them to hand.

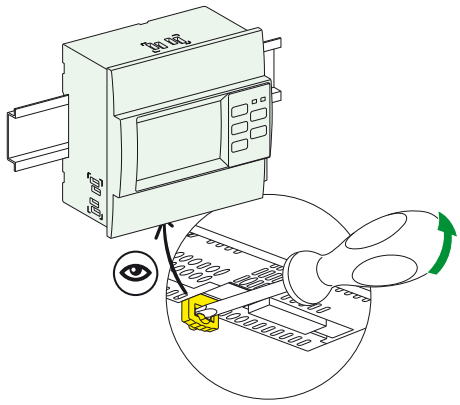
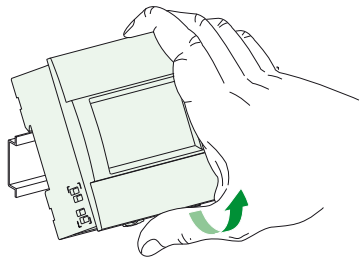
DIN Rail Mounting

To install the Vigilohm on a DIN rail, proceed as follows:

Step	Action
1	Position the 2 upper slots on the rear of the Vigilohm on the DIN rail.
2	Press the device against the DIN rail until the locking mechanism engages. The device is now attached to the rail. 

Removal from a DIN rail

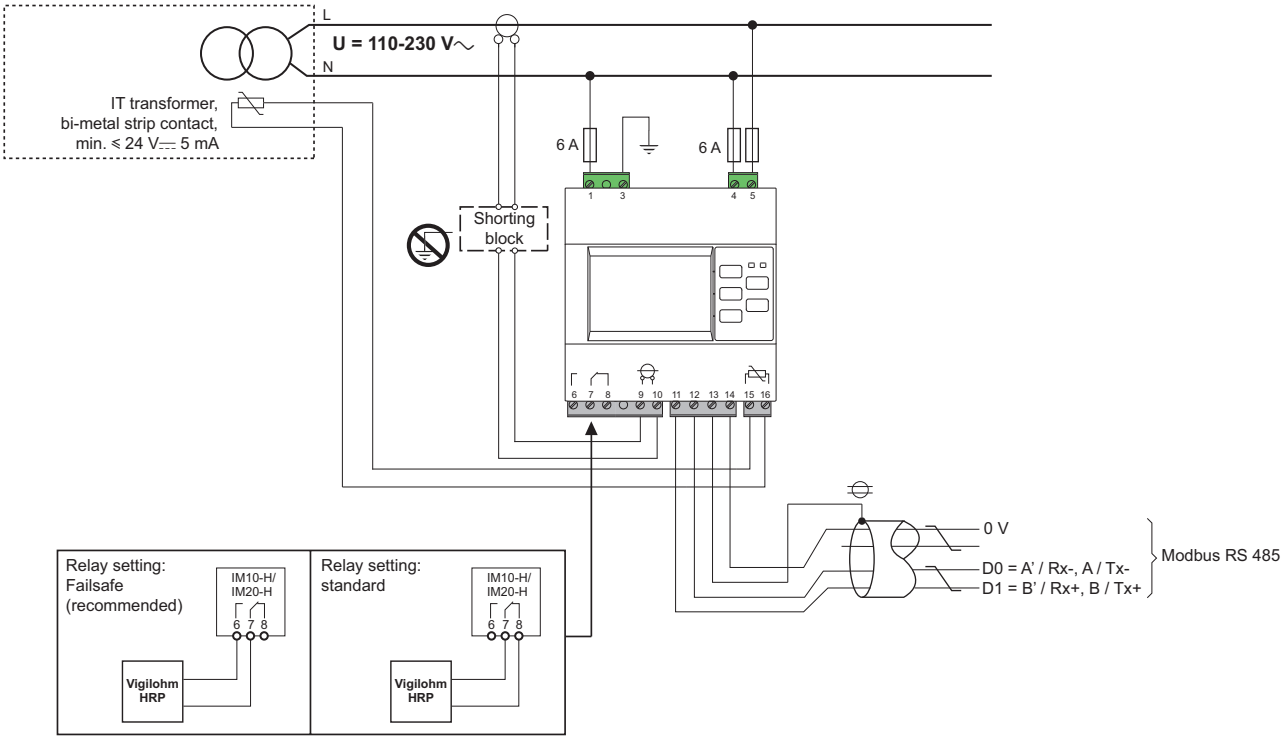
To remove the Vigilohm from a DIN rail, proceed as follows:

Step	Action
1	Using a flat screwdriver (≤ 6.5 mm), lower the locking mechanism to release the device. 
2	Lift the device up to free it from the DIN rail. 

Connection

Connection Diagram

Terminals 9 to 16 are not available on the Vigilohm IM10-H.



The alarm relay is connected in the same way with a programmable logic controller (PLC) as part of the advanced solution for an operating block.

Connection Characteristics

All the terminals of the Vigilohm IM10-H and IM20-H have identical characteristics.

The table below shows the characteristics of the cables that can be used to connect the terminals:

Stripped Length	Cable c.s.a.	Tightening Torque	Type of Screwdriver
7 mm	0.2...2.5 mm²	0.8 N•m	Flat, 3 mm

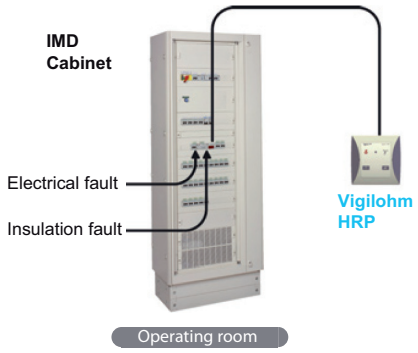
Typical Applications

Presentation

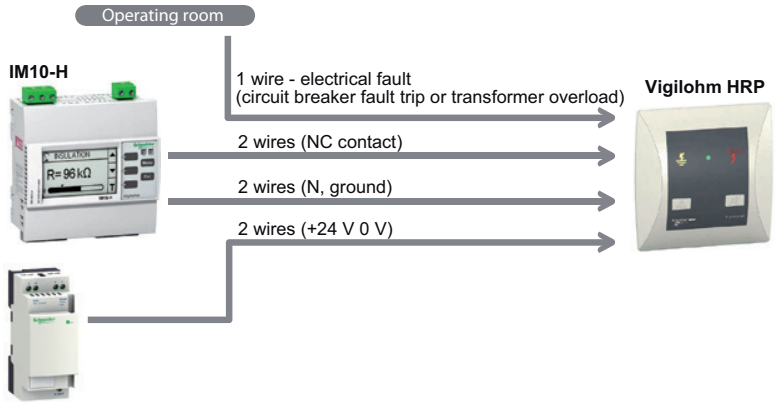
The following section presents 2 insulation monitoring applications for an operating room:
- One with a Vigilohm IM10-H and a Vigilohm HRP
- One with a Vigilohm IM20-H where the alarm is sent to a supervisor

Architecture with Vigilohm IM10-H and Vigilohm HRP

By virtue of the fact that there is a Vigilohm HRP present in the operating room, this monitoring system can be used to collate and display all the information relating to the alarms generated by the electrical installation.



Vigilohm HRP Connection Principle:



ABL8MEM24003
Existing or special power supply
For example: ABL8MEM24003

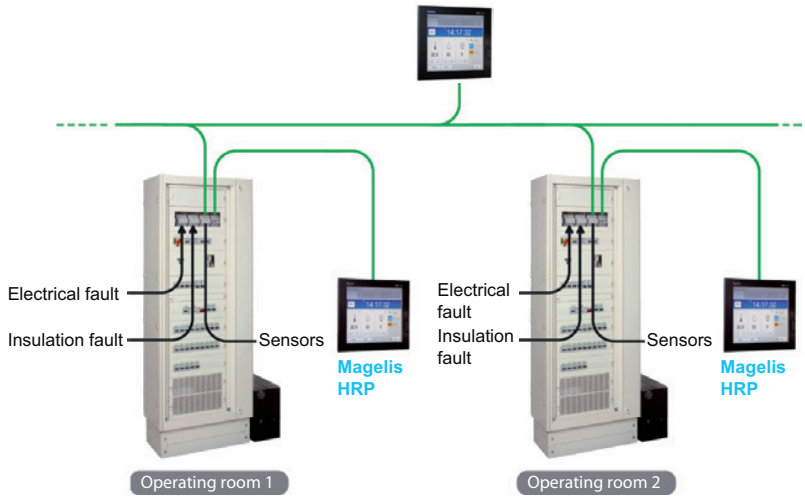
A slightly different version of this architecture is also possible, whereby a Vigilohm IM20-H is connected to a supervisor outside the operating room via Modbus.

Architecture with Vigilohm IM20-H and supervisor

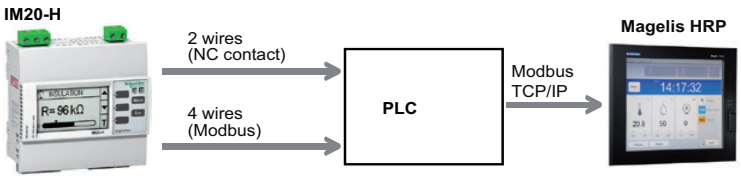
By using Modbus communication, the operating room staff or maintenance staff can be provided with:

- The insulation value
- The load level of the transformer
- The alarms
- Time tagging of events

This ensures the traceability of all events.



Principle involved in connecting to a supervisor:



Functions

3

What's in this Chapter?

This chapter contains the following topics:

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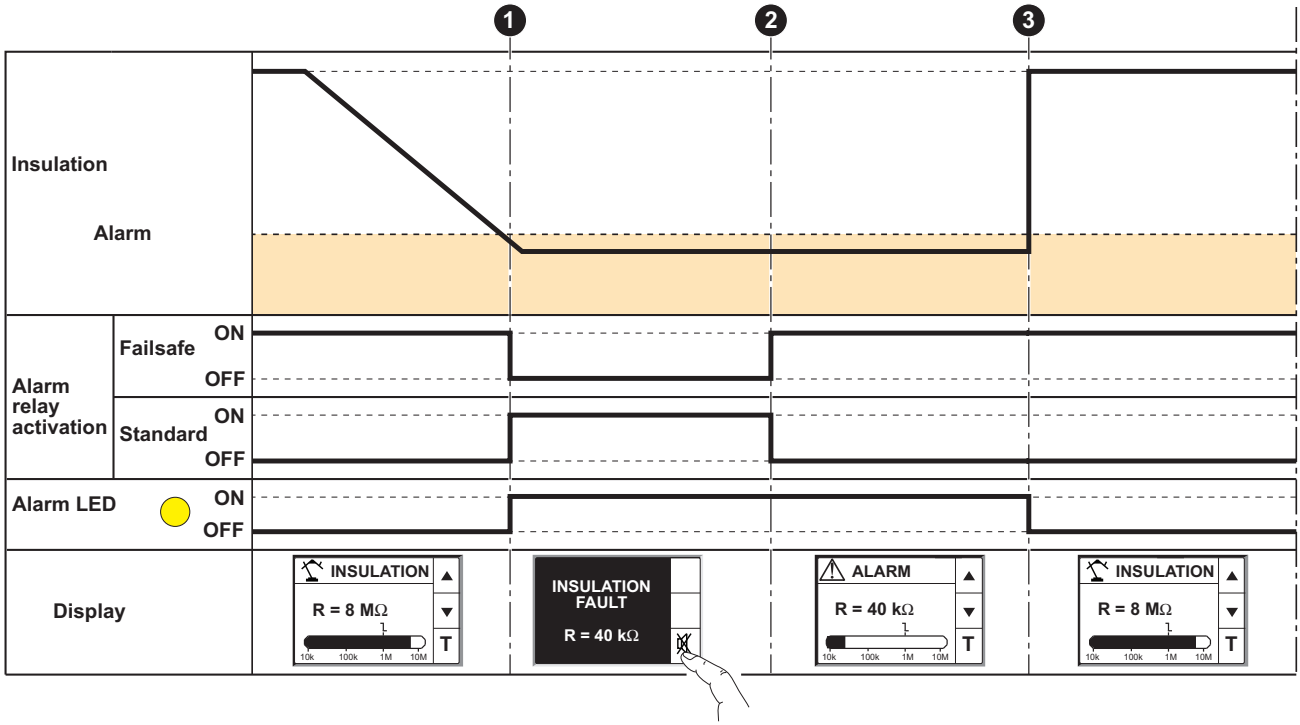
Monitoring the System Insulation

Functional Description

The Vigilohm monitors the IT system insulation in kΩ in accordance with the following timing diagram:



1 An insulation fault is detected on the system, the Vigilohm switches to the alarm status. The alarm relay changes over and the alarm LED lights up.
2 The user acknowledges the alarm by pressing the button. The alarm relay reverts to its initial status.
3 The insulation fault is corrected. The alarm LED goes out. The Vigilohm reverts to normal status.

When the Vigilohm is in the alarm status and the user fails to acknowledge the alarm, the insulation fault is transient.

Status Information

The display and the 2 two-color LEDs on the Vigilohm indicate the device's current status.

LEDs		Description
ON	Alarm	
		Vigilohm de-energized
flashes slowly		Vigilohm energized, no insulation fault detected
flashes slowly		Vigilohm energized, insulation fault detected
flashes slowly	flashes	Vigilohm energized, transient insulation fault detected
		Vigilohm energized but malfunctioning

Alarm Threshold

- Setting range: 50...500 kΩ
- Default value: 50 kΩ

When the device is powered up, it reverts to the most recent alarm threshold value saved.

Alarm Relay

Depending on the status of the insulation, the alarm relay is, or is not, activated according to the mode selected: failsafe (by default) or standard.

The failsafe alarm relay is activated in the following cases:
- An insulation fault is detected.
- The product has failed.
- The product is not being supplied with power.

Transformer Monitoring

Presentation

The IT system can be used to ensure optimum availability.

All or part of the system can potentially still be lost in the event of a transformer overload or short circuit.

The impact of a short circuit is limited by discrimination.

Overload

The relevant standard stipulates that overloads and increases in temperature must be monitored in relation to IT system transformers.

With the Vigilohm IM10-H, this monitoring function is performed independently of insulation monitoring.

In the case of the Vigilohm IM20-H, the function is integrated to facilitate operation and implementation.

To avoid global tripping as a result of an overload, the transformer load current is measured continuously, displayed as a load percentage and compared with an alarm threshold.

Due to the fact that high temperature is the result of prolonged overload, temperature monitoring is less critical and the incorporation of a bimetal temperature sensor is perfectly sufficient.

A transformer fault constitutes a critical installation fault (which is not true of an insulation fault):

- On the Vigilohm IM20-H, transformer faults take priority over an insulation fault.
- On the Vigilohm HRP, the red LED for indicating an electrical fault lights up in the event of a transformer fault.
- On the Magelis panel (advanced solution for operating room), the load is displayed in the form of a bar graph and a dedicated alarm.

Integration with an Existing Supervision Solution

All the transformer data (alarms, current, thresholds) is available via Modbus communication.

Self-test

Description

The Vigilohm has a self-test function for testing:
- The product: LEDs, internal electronics
- The measurement system and the alarm relay

Running the Self-test

The test can be run/runs:
- Manually at any time by pressing the **T** contextual menu button on one of the system insulation monitoring screens
- Automatically:
  - Whenever the device starts up (power-up or reset)
  - Every 5 hours (except when the device is in the alarm status, regardless of whether the alarm is active, has been acknowledged, or is transient).

Sequence of LEDs

During the verification sequence, the LEDs light up in the following order:
- **Alarm** white
- **ON** red
- **Alarm** yellow
- **ON** green

Self-test OK

If the self-test is successful, the following screen appears for 3 seconds:

After that, one of the status screens appears automatically (system insulation resistance measurement, insulation fault alarm, or IT transformer fault alarm).

Self-test Not OK

If the self-test fails, the **Alarm** LED turns red and a message is displayed to indicate that the product is malfunctioning.

If this happens, briefly disconnect the auxiliary power supply of the Vigilohm. If the fault persists, contact technical support.

Human Machine Interface

4

Presentation

The Vigilohm features a sophisticated and intuitive human machine interface (HMI) with signaling LEDs, a graphic display, and contextual menu buttons for accessing the information required to operate the Vigilohm and make parameter settings.

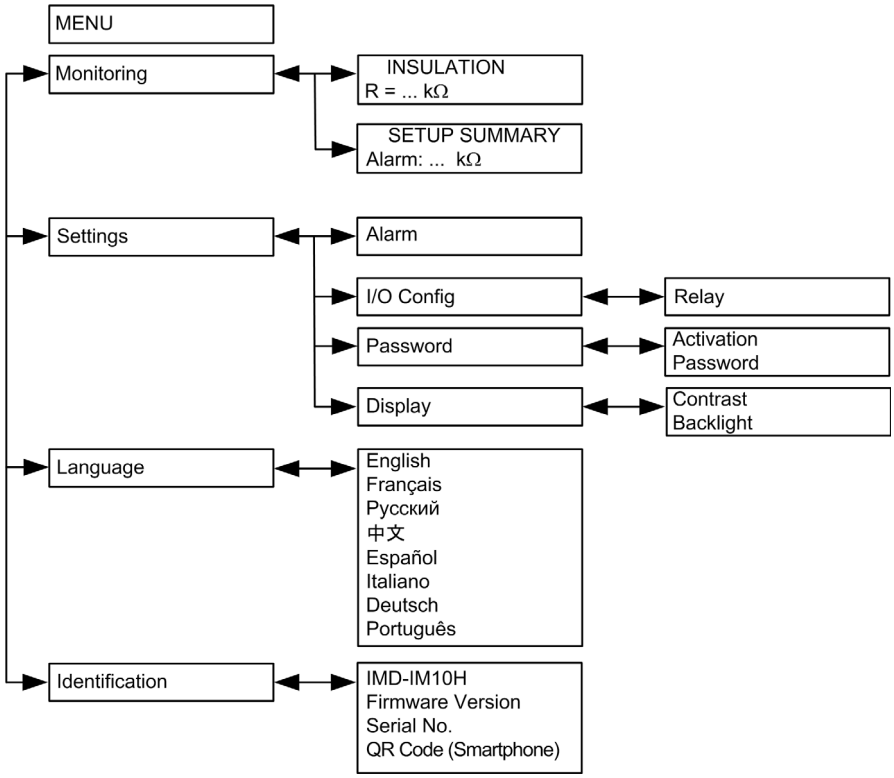
What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Vigilohm IM10-H Menu Structure	32
Vigilohm IM20-H Menu Structure	33
Navigating the Interface	34
Status Screens	36
Modifying Parameters	37
Clock (Vigilohm IM20-H)	38
Insulation Fault Log (Vigilohm IM20-H)	39

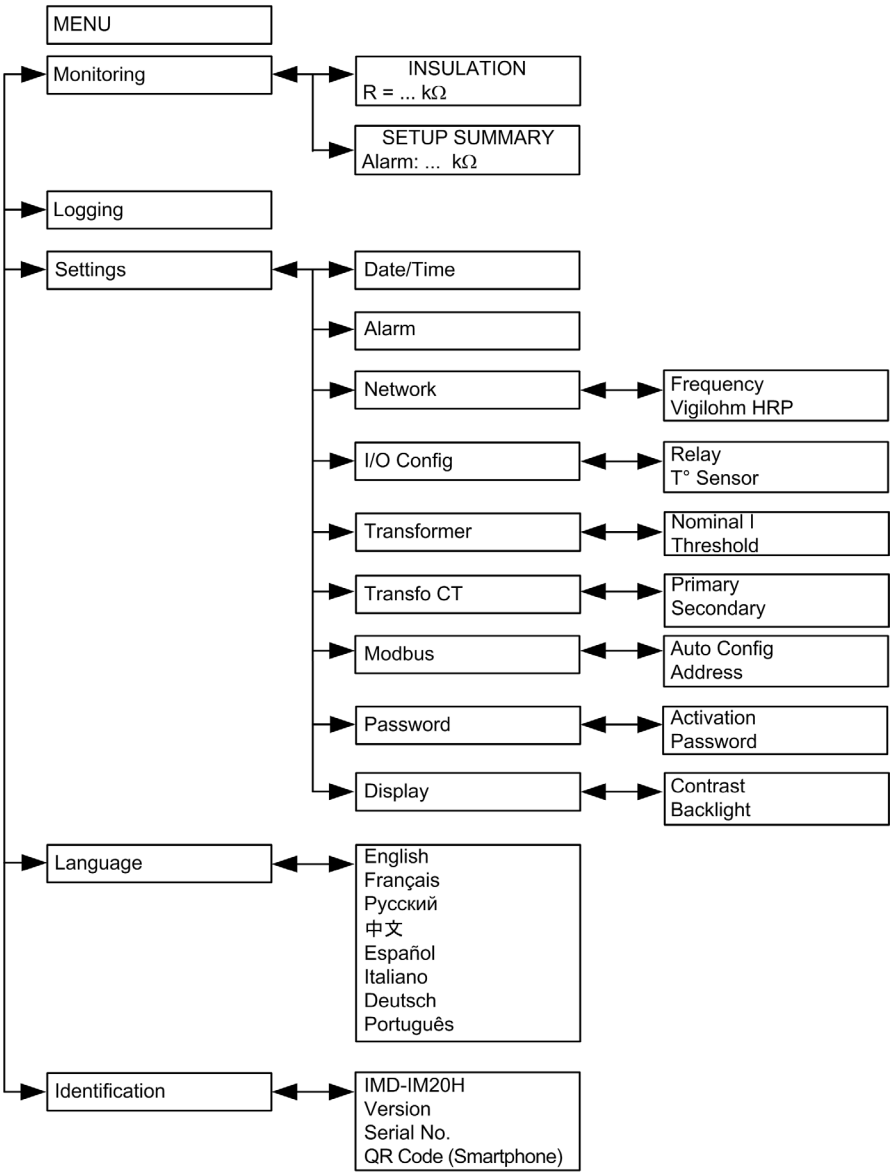
Vigilohm IM10-H Menu Structure

Vigilohm IM10-H Menu Structure



Vigilohm IM20-H Menu Structure

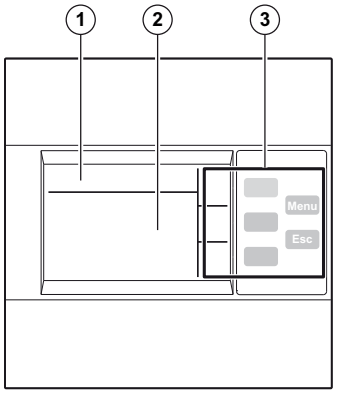
Vigilohm IM20-H Menu Structure



Navigating the Interface

Presentation

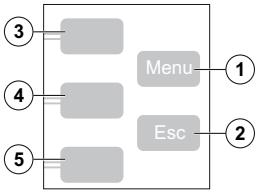
The diagram below illustrates the various elements for operating the Vigilohm.



1 Screen identification area containing a menu icon, and the name of the menu or parameter
2 Information area for displaying screen-specific details (measurement, alarm, setting)
3 Navigation buttons

Navigation Buttons

The navigation buttons enable quick and intuitive navigation:



Legend	Button	Icon	Description
1	**Menu**	–	Displays the level 1 menu (**Menu**)
2	**Esc**	–	Takes you back to the previous level
3	Contextual menu button 3	▲	For scrolling up the display or moving to the previous item in a list
		🕒	For accessing the date and time setting If the clock icon flashes, it means that the Date/Time parameter needs to be set.
		+	For increasing a numerical value
4	Contextual menu button 2	▼	For scrolling down the display or moving to the next item in a list
		←	For moving one digit to the left within a numerical value. If the digit on the far left is already selected, pressing the button loops you back to the digit on the right.
		→	For moving one digit to the right within a numerical value
5	Contextual menu button 1	OK	For confirming the selected item
		T	For executing the manual test
		↵	For accessing a menu or sub-menu, or for editing a parameter
		🔕	For acknowledging alarms

Information Icons

The following table describes the icons provided for information in the information area of the LCD display. Among other things, they indicate which menu is selected or the alarm status.

Icon	Description
	Main menu
	• Identifies the system resistance when there is no insulation fault • Measurement parameters menu
	Fault log menu (Vigilohm IM20-H)
	Setting parameters menu
	Interface language selection menu
	Product identification
	Indicates an insulation fault alarm

Status Screens

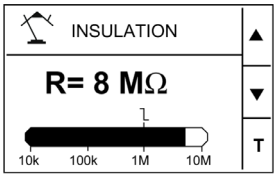
Presentation

The default screen is the one that shows the system's insulation resistance value. This is automatically replaced by a screen for indicating an insulation fault or a transformer fault (where applicable).

The alarm screens flash.

System Insulation Resistance Measurement (R)

The Vigilohm displays the insulation resistance measurement for the system by default.



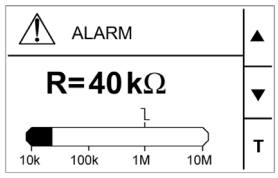
Alarm Detected: Insulation Fault Message

The following screen is displayed when the insulation value drops below the alarm threshold:

Press the contextual menu button to acknowledge the alarm.

Alarm Acknowledged

The following screen appears once the alarm is acknowledged:

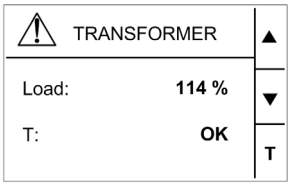


Transformer Alarm Message

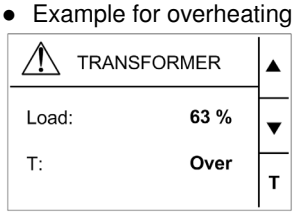
The following screen appears in the event of the IT transformer becoming overloaded or overheating:

Press the **OK** contextual menu button to exit the screen. The alarm screen for the transformer affected by the fault now appears.

- Example for transformer overload:



- Example for overheating of transformer:



Modifying Parameters

Presentation

To modify any of the values, you must be thoroughly familiar with how the interface menus are structured and the general navigation principles. For more information about how the menus are structured, please refer to the section that relates specifically to your Vigilohm model:

- IM10-H *(see page 32)*
- IM20-H *(see page 33)*

To modify the value of a parameter, follow either of the 2 methods described below:

- Select an item (value plus unit) in a list.
- Modify a numerical value, digit by digit.

The parameters listed below are the only ones where the numerical value can be modified:

- Date
- Time
- Password
- Modbus address (Vigilohm IM20-H)

Selecting the Value in a List

To select a value in a list: Use the ▼ or ▲ contextual menu buttons to scroll through the parameter values until you reach the desired value; then press **OK** to confirm the new parameter value.

Modifying the Numerical Value

The numerical value of a parameter is made up of digits and it is the one on the far right that is selected by default.

To modify a numerical value, use the contextual menu buttons as described below:

- ✚ allows you to modify the selected digit.
- ⬅ allows you to select the digit to the left of the one that is currently selected, or to loop back to the digit on the right.
- **OK** confirms the new parameter value.

Saving a Parameter

After you have confirmed the modified parameter, one of 2 things will happen:

- If the parameter has been saved correctly, the screen displays **Saved** and then automatically reverts to the previous display.
- If the parameter has not been saved correctly, the screen displays **Out Of Range** and the editing screen remains active. A value is deemed to be out of range when it is classed as forbidden or when there are several interdependent parameters, for example.

Aborting an Entry

To abort the current parameter entry, press the **Esc** button. The screen reverts to the previous display.

Clock (Vigilohm IM20-H)

Description

The time must be set:
- Whenever the power supply is interrupted
- When switching from winter to summer time

If the auxiliary power supply is interrupted, the Vigilohm IM20-H retains the date and time setting from immediately before the interruption.

The Vigilohm IM20-H uses the date and time parameter to time-tag the system insulation faults and the transformer alarms recorded.

Icon

When the Vigilohm IM20-H is powered up, the clock icon flashes on the system monitoring screens to indicate that the clock needs to be set.

Setting

To set the date and time, please refer to the procedure for modifying a numerical value *(see page 37)*.

Date/Time Format

The date is displayed in the format: dd/mm/yyyy.

The time is displayed using the 24-hour clock in the format: hh/mm.

Insulation Fault Log (Vigilohm IM20-H)

Description

The Vigilohm IM20-H records the last 30 events from the following categories:

- Alarm
- Transformer overload
- Overheating of transformer

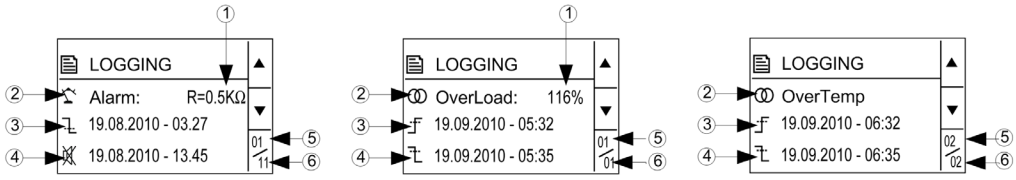
Event 1 is the one that was recorded most recently and event 30 is the oldest recorded event.

The oldest event is deleted when a new event occurs (the table is not reset).

By referring to this information, the performance of the distribution system can be improved and maintenance work facilitated.

Fault Event Screen

The diagrams below show the display elements associated with each type of fault event:



Legend	Description
1	Insulation value or load percentage at the time of the fault's occurrence
2	Type of fault recorded: Insulation fault, overload, or overheating of transformer
3	Date and time of the fault's occurrence
4	Date and time when the event disappeared: ● Alarm acknowledgment ● Disappearance of alarm ● Disappearance of transformer alarm
5	Number of event displayed
6	Total number of events recorded

Communication via Modbus RS-485 (Vigilohm IM20-H)

5

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Configuration of the RS-485 Communication Port	42
Table of Modbus Functions	43
Modbus Registers Table	44

Configuration of the RS-485 Communication Port

Communication Parameters

Before initiating any communication processes, configure the Modbus communication port via the HMI (**Settings** → **Modbus** menu) on the Vigilohm IM20-H:

Parameters	Authorized Values	Default Value
Baud rate	• 4800 Baud • 9600 Baud • 19 200 Baud • 38 400 Baud	19 200 Baud
Parity	• Even • Odd • None	Even
Address	1...247	1

Signaling of Communication Activity

On the Modbus parameter setting screen, the green **ON** LED indicates the status of communication between the Vigilohm IM20-H and the master as follows:

If...	Then...
The LED is flashing	Communication with the device has been correctly established
The LED is on permanently	There is no active communication between the master and slave

Table of Modbus Functions

Modbus Functions

Function Code		Function Name
Decimal	**Hexadecimal**	
3	0x03	Read Holding Registers(1)
4	0x04	Read Input Registers(1)
6	0x06	Write Single Register
8	0x08	Diagnostics
16	0x10	Write Multiple Registers
67 / 14	0x43 / 14	Read Device Identification
67 / 15	0x43 / 15	Get Date/Time
67 / 16	0x43 / 16	Set Date/Timee
(1) The Read Holding and Read Input registers are identical		

Modbus Registers Table

Table Format

Register tables have the following columns:

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					

- **Modbus Register Address**: Address of register encoded in the Modbus frame, in decimal (dec) and hexadecimal (hex) formats
- **RW**: Whether the register is read only (R) or read-write (RW)
- **Unit**: The unit the information is expressed in
- **Type**: The encoding data type
- **Range**: The permitted values for this variable, usually a subset of what the format allows
- **Description**: Provides information about the register and the values that apply

System Status

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					
102...103	65...66	R	–	Uint16	Encoded version X.Y.Z	Firmware version X.Y.Z: • X represents the primary revision number, which is encoded in the most significant byte of register 102. • Y represents the secondary revision number, which is encoded in the least significant byte of register 102. • Z represents the quality revision number, which is encoded in register 103.
105	69	RW	–	Uint16	• 0...99 • –	• Year (from 2000 to 2099) in least significant byte • Most significant byte reserved
106	6A	RW	–	Uint16	• 1...12 • 1...31	• Month in most significant byte • Day in least significant byte
107	6B	RW	–	Uint16	• 1...23 • 0...59	• Time in most significant byte • Minutes in least significant byte
108	6C	RW	ms	Uint16	0...59999	Milliseconds

109	6D	R	–	Uint16	–	• Most significant byte = Error code
						• Least significant byte = Product status
						  • 0x00 - Normal operation
						  • 0x01 - Self-test
						  • 0x02 - Insulation fault and/or transformer fault
						  • 0x03 - Wiring connection lost
						  • 0x04 - Over limit capacitance
						  • 0x05 - Product malfunctioning

Monitoring

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					
1000	3E8	R	Ohm	Float32	–	Resistance. The value NaN (Not a Number) 0xFFC00000 is returned during the self-test.
1006	3EE	R	%	Uint32	–	Transformer load current. The value NaN (Not a Number) 0xFFC00000 is returned during the self-test.
1008	3F0	R	–	Uint16	• 0 = Correct temperature • 1 = Temperature too high	I/O wiring: Overheating of transformer

Alarm Status

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					
1100	44C	R	–	Uint16	• 0 = No alarm • 1 = Alarm active • 8 = Alarm acknowledged	Alarm
1101	44D	R	–	Uint16	• 0 = No alarm • 1 = Overload alarm • 2 = Overheating alarm • 3 = Overload and over-heating alarms active	Transformer alarm

Settings

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					
3001	BB9	RW	–	Uint16	• 1 = Standard connection • 2 = Failsafe	Alarm relay logic command. Default value: 2 (Failsafe).
3002	BBA	RW	Ohm	Uint32	50...500 kΩ	Alarm threshold. Default value: 50 kΩ.
3010	BC2	RW	A	Uint16	• 1A • 5A	Transformer CT, secondary. Default value: 5 A.
3011	BC3	RW	A	Uint16	40...250	Transformer CT, primary. Default value: 50 A.
3012	BC4	RW	%	Uint16	1...100	Transformer overload threshold. Default value: 80%.
3013	BC5	RW	A	Uint16	12...250	Transformer nominal current. Default value: 36 A.
3014	BC6	RW	–	Uint16	0000...9999	Password. Default value: 0000.
3015	BC7	RW	–	Uint16	• 0 = Deactivated • 1 = Activated	Password protection. Default value: 0 (Deactivated).

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					
3016	BC8	RW	–	Uint16	• 0 = English • 1 = Français • 2 = Русский • 3 = 中文 • 4 = Español • 5 = Italiano • 6 = Deutsch • 7 = Português	Interface language. Default value: 0 (English).
3017	BC9	RW	%	Uint16	0...100	Display contrast. Default value: 50.
3018	BCA	RW	%	Uint16	10...100	Display brightness. Default value: 100.

Log

Modbus Register Address		RW	Unit	Type	Range	Description
dec	hex					
4000	FA0	R	–	Uint16	1...60	Number of event records
4001	FA1	R	–	Uint16	–	Number of most recent record
4002-4013	FA2-FAD	R	–	Record	–	Record 1
4014-4025	FAE-FB9	R	–	Record	–	Record 2
...						
4710-4721	1266-1271	R	–	Record	–	Record 60

Each event is stored using 2 records:

- A "primary" record, which is created when the alarm occurs. This contains the insulation value, transformer load, or status of the transformer temperature sensor.
- A "secondary" record, which is created when the alarm disappears. This contains the type of event (acknowledged alarm, disappearance of overload or overheating event).

The 2 records are not consecutive (for example, scenario in which a transformer alarm occurs during an insulation fault).

Description of an Event Record in the Log

Register	Unit	Type	Range	Description
Word 1	–	Uint16	1…65535	Event record number
Word 2 Word 3 Word 4 Word 5	–	Uint64	–	Time tagging of event (using the same code as for the product date/time)
Word 6 Word 7	–	Uint32	• 0...1 • 0x40, 0x10 • 1000, 1006, 1008, 1100, 1101	Record identifier: • Word 6, most significant byte: Information for primary/secondary record. This field assumes a value of 1 for the primary record and a value of 0 for the secondary record. • Word 6, least significant byte: Type of data stored in the **Value** field • Word 7: Address of the Modbus register that is the source of the data in the **Value** field

Word 8
Word 9
Word 10
Word 11
	–	Uint64	–	Depending on the type of record (primary or secondary):
				• Primary record (when the event occurs):
				  • Insulation resistance value (in ohms) (encoded in Float32 in the last 2 registers)
				  • Transformer load (as a % of the nominal load encoded in Uint32 in the last 2 registers)
				  • Status of bimetal strip (encoded in Uint16 in the last register)
				• Secondary record (when the event disappears or is acknowledged):
				  • Alarm type (encoded in Uint16 in the last register)

Word 12	–	Uint16	1...65534	Primary/secondary record identifier for event: • In the case of a primary record for an event, this identifier is an odd integer; numbering starts at 1 and the number is incremented by 2 for each new event. • In the case of a secondary record for an event, this identifier is equal to the primary record identifier plus 1.

Example of an Event

The 2 records below represent an alarm that occurred at 12:00 on October 1, 2010 and was acknowledged at 12:29.

Record number: 1

Modbus Register Address		Unit	Type	Value	Description
dec	hex				
4002	FA2	–	Uint16	1	Record number
4003	FA3	–	Uint64	• 10 • 0 • 10 • 1 • 12 • 0 • 0	Date when alarm occurred (October 1, 2010, 12:00)
4007	FA7	–	Uint32	• 1 • 0x40 • 1000	Record identifier: • Primary record plus secondary record • Float32 value (insulation resistance) • Value of register 1000 (register for insulation resistance monitoring)
4009	FA9	Ohm	Uint64	10000	Insulation resistance value at the time of the alarm
4013	FAD	–	Uint16	1	Secondary record identifier for event

Record number: 2

Modbus Register Address		Unit	Type	Value	Description
dec	hex				
4014	FAE	–	Uint16	2	Record number
4015	FAF	–	Uint64	• 10 • 0 • 10 • 1 • 12 • 29 • 0	Date when alarm disappeared (October 1, 2010, 12:29)
4019	FB3	–	Uint32	• 1 • 0x10 • 1100	Record identifier: • Secondary record • Uint16 value (alarm acknowledged) • Value of register 1100 (alarm status register)
4021	FB5	–	Uint64	8	Value of alarm register at the time of alarm acknowledgment
4025	FB9	–	Uint16	2	Secondary record identifier for event

Maintenance and Troubleshooting

6

Maintenance and Troubleshooting

Safety Precautions

The following safety precautions must be thoroughly implemented before attempting to repair electrical equipment or carry out maintenance. Carefully read and follow the safety precautions described below.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, ARC FLASH OR BURNS

- Wear suitable personal protective equipment and follow the currently applicable electrical safety instructions. See, for example, standard NFPA 70E when carrying out work in the USA.
- Only qualified personnel should maintain this equipment. Such work should be performed only after reading all the installation instructions.
- Turn off all power supplying this equipment before working on or inside it.
- NEVER work alone.
- Beware of potential hazards and wear personal protective equipment.

Failure to follow these instructions will result in death or serious injury.

NOTICE

RISK OF DAMAGE TO VIGILOHM

- Never open the Vigilohm unit.
- Do not attempt to repair any components in the Vigilohm range, either in the unit or an accessory.

Failure to follow these instructions can result in equipment damage.

ON LED

The red **ON** LED indicates an error relating to one of the following:
- Interruption of the injection circuit
- Self-test not OK
- Device fault

Interruption of the Injection Circuit

If the injection circuit of the Vigilohm is interrupted, the display shows the message below and starts flashing:

Self-test

The Vigilohm performs a series of self-tests on start-up, and then at regular intervals during operation, in order to detect any potential faults in its internal and external circuits. For more information on the self-test function, please refer to the relevant section *(see page 29)*.

Troubleshooting

The table below describes the potential problems and their probable causes. It also indicates the checks that can be carried out or provides possible solutions for each scenario. If you are still unable to resolve a problem after consulting the table, please contact your Schneider Electric regional sales representative for assistance.

Potential Problem	Probable Cause	Possible Solution
The device displays nothing when switched on.	The device is not being supplied.	Check the auxiliary power supply is present.
	The auxiliary power supply does not comply.	Check the value of the auxiliary voltage: U = 90...265 Vac.
The device signals an insulation fault, but your system shows no signs of abnormal behavior.	The fault alarm threshold is not appropriate.	Check the value of the alarm threshold. Modify the alarm threshold if necessary.
You deliberately create an insulation fault, but the device fails to detect it.	The resistance value used to simulate the fault is greater than the value of the fault threshold.	Use a resistance value that is lower than the alarm threshold or modify the alarm threshold.
	The fault is not detected between neutral and ground.	Start again ensuring you are between neutral and ground.
The **ON** LED is red and the display shows "**WIRING CONNECTION LOST**".	The Vigilohm injection circuit is cut off.	Check the connection on the injection terminal block (terminals 1 and 3) and restart the self-test.
The **ON** LED is red and the display indicates that an error occurred during the self-test.	The Vigilohm injection circuit is cut off.	Briefly disconnect the auxiliary power supply for the Vigilohm.
Although the Vigilohm is being supplied with power, the **ON** LED does not light up.	Faulty LED.	Restart the self-test and check that the **ON** LED lights up briefly.
The **Alarm** LED does not light up in the event of a fault.	Faulty LED.	Restart the self-test and check that the **Alarm** LED lights up briefly.

Specifications

7

Specifications

Type of System to Be Monitored

Characteristic		Value
LV AC/DC IT systems	Phase-to-phase voltage range	0-230 Vac (+ 15%)
	Frequency	50/60 Hz

Electrical Characteristics

Characteristic			Value
Range for insulation resistance readings			1 kΩ...10 MΩ
Fault signaling	Number of thresholds		1 (password protected)
	Thresholds		50...500 kΩ
Response time			≤ 1 s
Maximum system capacitance			5 µF
Device performance test			Self-test and manual test
Internal impedance		At 50 Hz	110 kΩ
Accuracy			5%
Output contact	Number		1 (standard or failsafe)(1)
	Type of contact		Changeover
	Breaking capacity	250 Vac	6 A
	Capacity	12...24 Vdc	6 A
Input contact		Voltage supplied	24 V
Bimetal transformer		Minimum load	5 mA
Auxiliary supply voltage		50/60 Hz	110-230 Vac (± 15%)
Cable dimensions			0.2...2.5 mm²
Maximum device consumption			12 VA
Measurement voltage			25 V max.
Measurement current			0.9 mA
Dielectric strength			4000 Vac/5500 Vdc
(1) Failsafe: The relay is deactivated either on occurrence of a fault or if the auxiliary supply voltage accidentally fails.			

Mechanical Characteristics

Characteristic		Value
Weight		0.25 kg
Thermoplastic case	Mounting	Panel or DIN rail
Degree of protection	Front	IP52
Installation	Inside, category III, pollution 2, in molded case, disconnectable unit, symmetrical or flush-mounted	

Other Characteristics

Characteristic			**Value**
Temperature range	For operation		–25...+55 °C
	For storage		–40...+70 °C
Climatic conditions(1)			IEC 60068
Standards		Product	IEC 61557-8 (Appendix A, Appendix B)
		Safety	IEC 61010-1 (2)
		Installation	IEC 60364-7-710

(1) Suitable for use in all climates:
- Damp heat, equipment not operating (IEC 60068-2-30)
- Damp heat, equipment operating (IEC 60068-2-56)
- Salt mist (IEC 60068-2-52)

(2) U ≤ 300 V L-N nominal

VIGED310023EN

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As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

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